

# Part One:

# How to Perform Your Soil Characterization



## Sample Sites for the Investigation

Each GLOBE school is expected to perform the Soil Characterization protocols for at least two study sites. These are the Soil Moisture Study Site (see *Part Two: Soil Moisture and Temperature*), and the Biology Study Site (see the *Land Cover/Biology Investigation*). At each location, students dig a hole and examine the soil. Obtaining a soil profile to a depth of at least one meter into the ground is preferred wherever possible. Since the Soil Characterization Protocols are done only once for each location, the sites for which they are performed are referred to in GLOBE as Soil Characterization Sample Sites.

In many places, the soil profiles will vary significantly across the 15 km x 15 km GLOBE Study Site. Characterizing soil profiles at locations other than the two required sites can provide important additional science data and educational opportunities, and you are invited to do them. There is no limit on the number of soil characterizations you may submit to the GLOBE Student Data Server.

Some special opportunities may exist within your GLOBE Study Site to view soil profiles without digging. Road cuts may expose soil profiles; these can be sampled and characterized, but you should obtain a fresh profile face by removing the weathered surface with a shovel before proceeding with your observations and samples. Excavation sites are often interesting and usable. As always, make sure to be safe, and obtain any permissions required.

## Locating a Soil Characterization Sample Site

There are several options for exposing and sampling the soil at a Soil Characterization Sample Site:

- Dig a soil pit at least 1 meter deep and as big around as is necessary to easily observe all of the soil horizons from the bottom to the top of the pit,
- Use a road cut, excavation site, or other location where others have exposed at least the top 1 meter of soil,
- Use an auger to remove soil samples to a depth of 1 meter, or
- Use a garden trowel or shovel to sample only the top 10 cm of soil if digging to a depth of 1 meter is not possible.

Some parts of the Soil Characterization Field Measurement Protocol are different depending upon which of these methods you are using.

If you will be digging to expose a soil profile, the Soil Characterization Sample Site should be:

- Safe for digging. Check with local utility companies and maintenance staff to ensure that you do not dig into or disturb a utility cable, water, sewer, or natural gas pipe, or sprinkler irrigation system of some kind,
- Under natural or representative cover. Find a relatively flat location with natural vegetation,
- Relatively undisturbed. Keep at least 3 meters from buildings, roads, paths, playing fields, or other sites where soils may have been compacted or disturbed by construction, and
- Oriented so that the sun will shine on the soil profile to ensure that the soil characteristics are clear for both naked-eye observations and photography.

# Preparing for the Field

## Bulk Density Containers

If your students have access to a soil drying oven, then they will be able to measure the bulk density of the soil layers. If not, skip this section and continue with the other materials to prepare.

If you are digging a soil pit, doing a near surface measurement or using a soil face exposed by others (road cut, excavation, etc.):

- Obtain 15 soil cans (enough for 5 horizons) or 3 cans if you will only be doing a near surface measurement.
- Label each can.
- Determine the volume of each can by:
  - Filling each can to the top with water (as full as you can).
  - Pouring the water into a graduated cylinder and measure its volume in mL (equal to cubic centimeters).
  - Recording the result on the Bulk Density Data Work Sheet. The volume of water that fills the can is equivalent to the volume of the can.
- Once the volume has been measured, make sure the can is dry and poke a small hole in the bottom of the can with a nail, to allow air in the can to escape when soil is being pressed into the can.
- Weigh each can.
- Record each weight on the Soil Bulk Density Data Work Sheet.
- Provide a lid or other means to seal each can for transport of the samples from the field to the laboratory.

If you are using the auger technique:

- Obtain 15 soil containers (enough for 5 horizons). In choosing containers remember the following:
  - The opening of each container should be large enough so that you can easily transfer a soil sample from the auger to the container without losing any of it.
  - The soil sample will be dried using a soil drying oven, and the best approach

is to place the soil directly into the container in which it will be dried.

- Plastic bags have big openings, but they melt and the soil sample must be transferred to metal, glass, or other containers before drying in the oven. Transferring the soil sample provides an opportunity for some of the sample to be lost.
- The combined weight of your container and soil sample must not exceed the capacity of your scale or balance.
- Label each container.
- Weigh each container in which the soil will be dried.
- Record each weight on the Soil Bulk Density Data Work Sheet.
- Provide a lid or other means to seal each container for transport of the samples from the field to the laboratory.

## Other Materials to Prepare

Fill a small acid bottle with distilled white vinegar to test for free carbonates.

Fill squirt bottles with water (it need not be distilled).

Make a clinometer if you do not already have one. See the *Land Cover/Biology Investigation*.